

The experimental comparison on the fluid warming performances of the Ranger™, ThermoSens®, and Mega Acer Kit® according to flow rates and distances



Sang Hun Kim, M.D., Ph.D.^{1,2}, Dong Jun Kim, M.D.¹, Ki Tae Jung, M.D.^{1,2},

Keum Young So, M.D., Ph.D.^{1,2}

Departments of Anesthesiology and Pain Medicine, Chosun University Hospital¹, Chosun University, School of Medicine², Gwangju, Republic of Korea

Background and Goal of Study

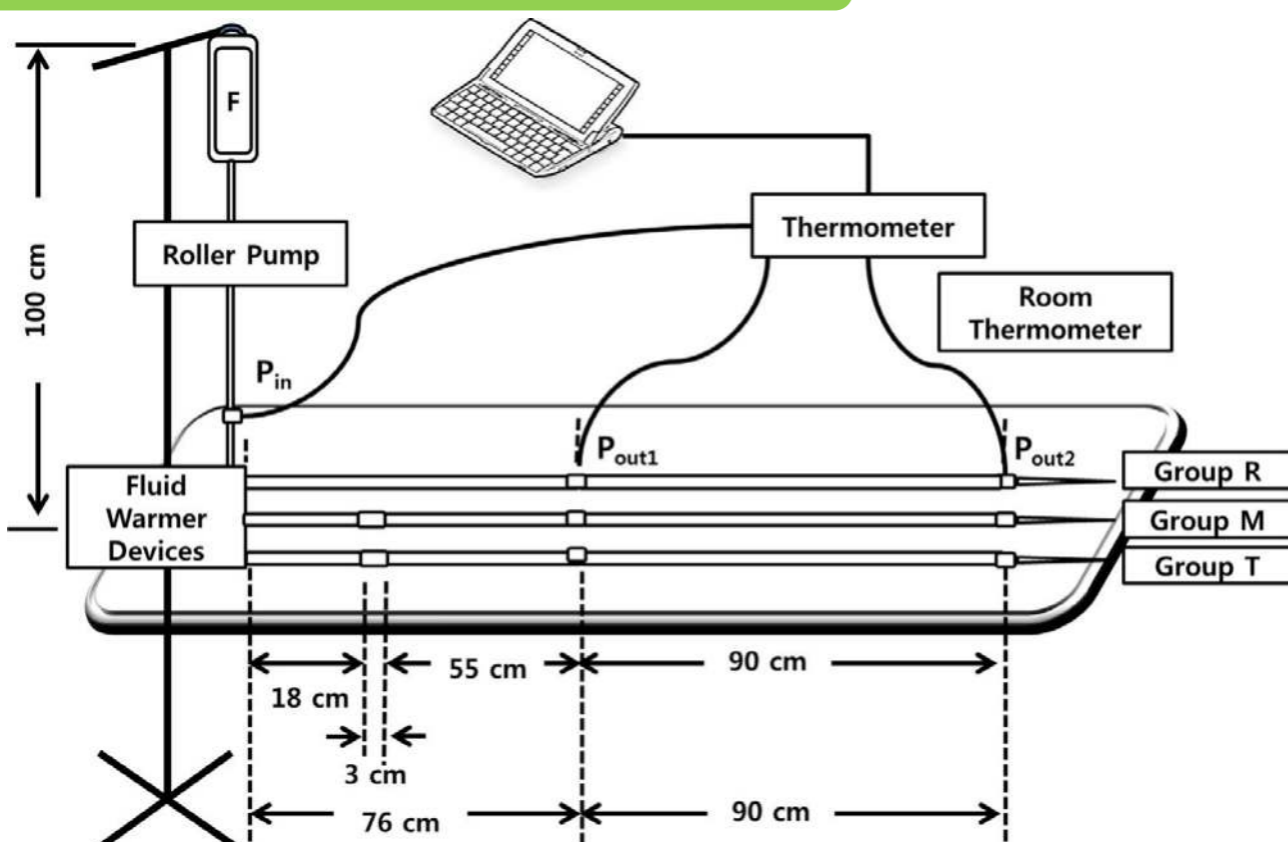
- ❖ The use of warming devices, which operate based on various principles, is useful for maintaining perioperative normothermia as well as for reducing morbidity and complications.
- ❖ Two new types of fluid warmers were developed: ThermoSens (Sewoon Medical Company, Seoul, Korea) with dry heat and Mega Acer Kit (Ace Medical, Seoul, Korea) with a newly designed heated circuit.
- ❖ The temperature of the delivered warming fluid can be decreased or increased by controlling the flow rate and distance. Therefore, in this study, we compared the fluid warming performances of Mega Acer Kit, Ranger, and ThermoSens according to different flow rates and distances from each device.

Materials and methods

- ❖ We used the following intravenous fluid warmers: Mega Acer Kit (Group M, n = 8), Ranger (group R, n = 8), and ThermoSens (group T, n = 8).
- ❖ Fluids that had been stored in the operating room over the previous 24 h were delivered at sequent flow rates of from 440 up to 2500 mL/h through preheated warming devices.
- ❖ The fluid temperatures were recorded at the inlet point, 76 cm proximal (P_{out1}) and 166 cm distal outlet points (P_{out2}) every 1 min for 10 min, and calculating ΔMBT after infusion of 1L of 0.9% normal saline.
- ❖ We repeated each test eight times.

$$\Delta MBT = \frac{(TF - TPt) * (SF) * (Vol)}{(SPt) * (Wt)}$$

Fig 1. Illustration of laboratory settings



Results and discussion

Fig 2. Fluid temperature with different flow rates within Group

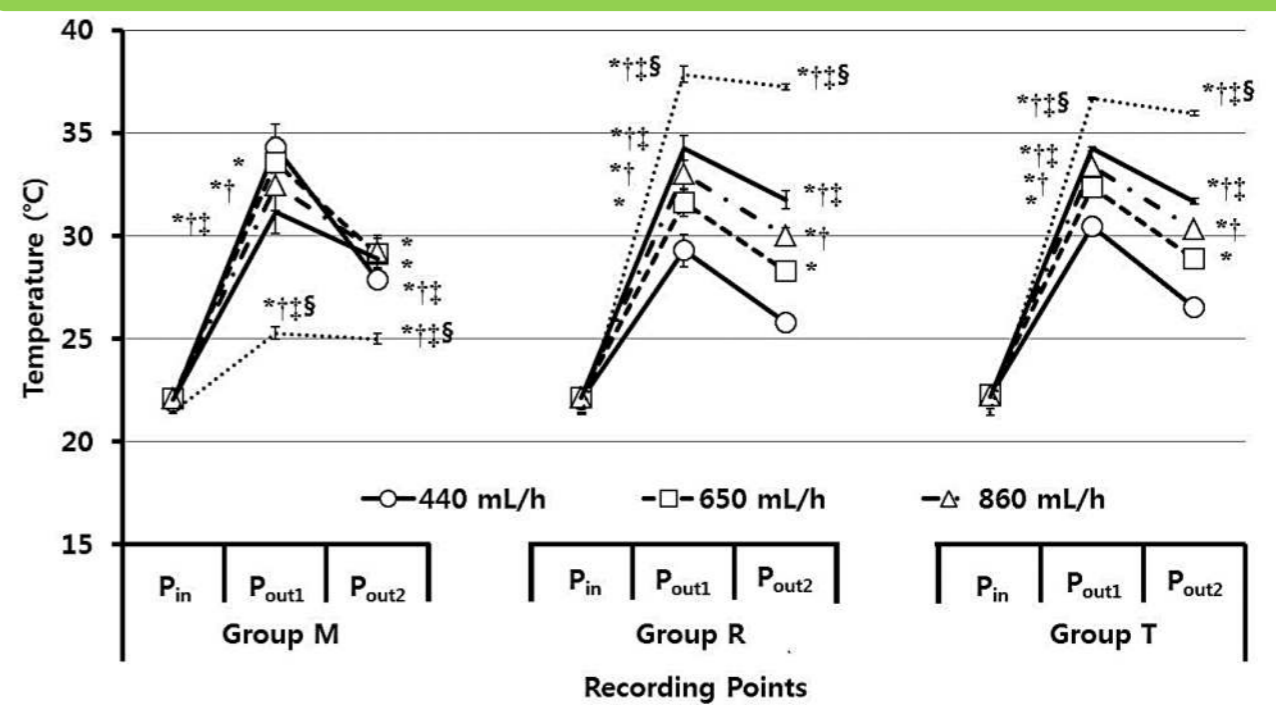


Fig 3. Fluid temperature with recoding points between groups

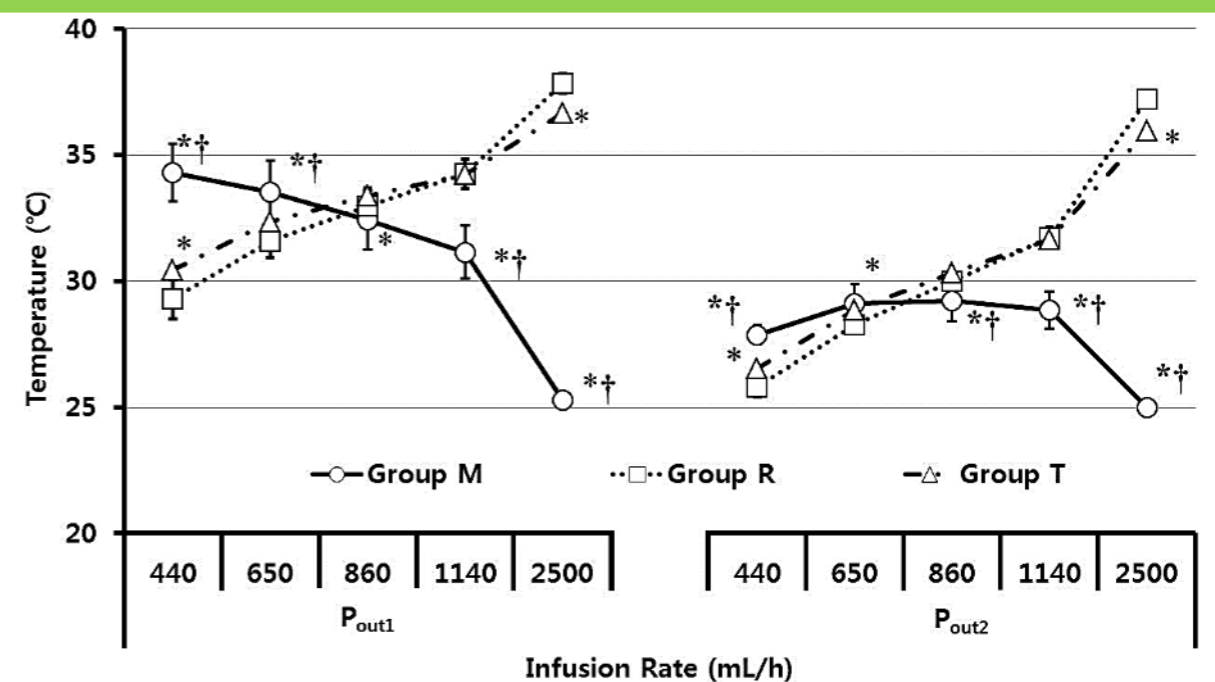
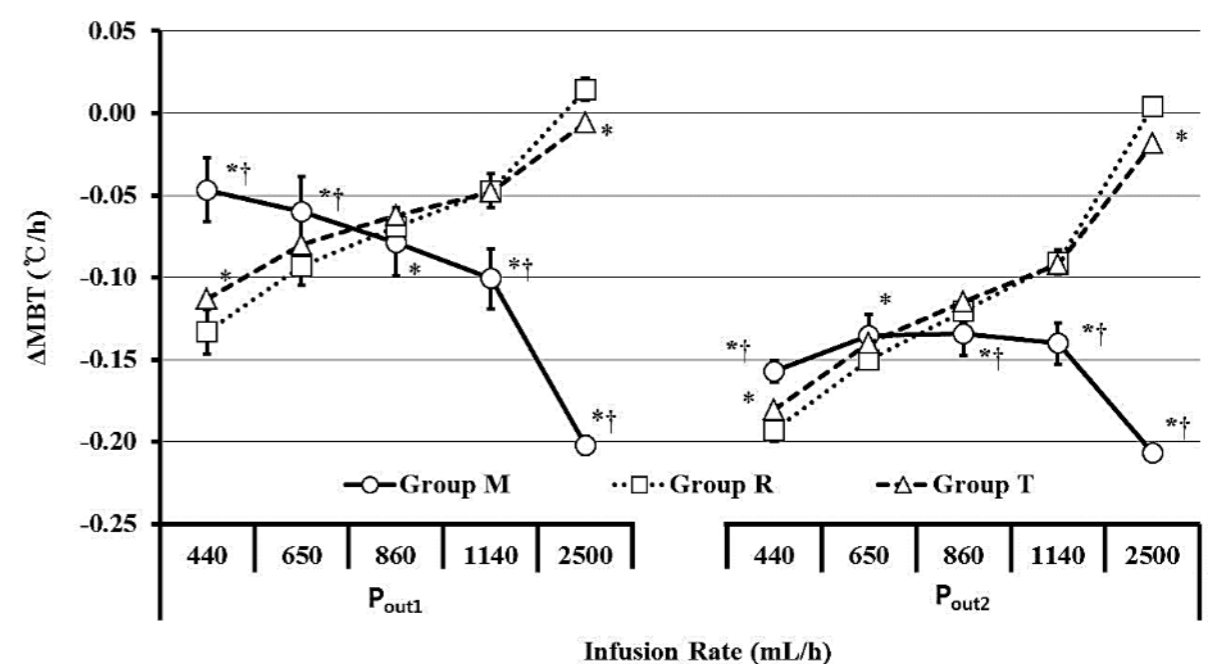


Fig 4. Expected change of mean body temperature (ΔMBT)



Conclusions

- ❖ Mega Acer Kit can warm fluid more effectively with the smallest ΔMBT at the low flow rate, whereas the ThermoSens and the Ranger are suitable at higher flow rates. Furthermore, the device performance may be more effective when shorter extension lines